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AIR FORCE PACKAGING EVALUATION AGENCY WRIGHT-PATTERSON--ETC F/6 13/4
TEST AND EVALUATION OF AIM 9L/MARK 17 AND 36 ROCKET MOTOR CONTA--ETC(U)
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TEST AND EVALUATION OF AIM 9L/MARK 17 AND 36
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Wright-Patterson AFB OH 45433

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ABSTRACT

One each of AIM 9L/MARK 17 and 36 shipping/storage containers with inert rocket motors were received from HQ ADTC/SDMT, Eglin AFB FL at the Air Force Packaging Evaluation Agency, Wright-Patterson AFB OH. Pressure and rough handling tests were conducted on the containers in accordance with Federal Test Method Standard 101B.

Visual inspection indicated no physical damage to the containers upon completion of the tests.

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INTRODUCTION

HQ ADTC/SDMT, Eglin AFB FL requested the Air Force Packaging Evaluation Agency (AFPEA), Wright-Patterson AFB OH to conduct pressure and rough handling tests on the AIM 9L/MARK 17 and 36 containers with inert rocket motors.

The AIM 9L/MARK 17 and 36 containers were originally fabricated by Metric Systems, Fort Walton Beach FL for shipment and storage of Sparrow missiles. For these tests each Sparrow container was modified to accept four inert rocket motors.

TEST OUTLINE AND TEST EQUIPMENT

Tests were conducted in accordance with Federal Test Method Standard (FTMS) 101B, Level A packing. Figures 1 through 3 outline the container test plans.

A Meriam, Model RC-4615, water manometer graduated in 0.20 inch increments was used for the leak tests. An Endevco, Model 2233E, piezoelectric accelerometer was used to instrument all tests on the AIM 9L/MARK 17 and 36 containers. Conditioning of the accelerometer output was accomplished by an Endevco charge amplifier, Model 2641C, powered by an Endevco power supply, Model 2622C. The continuous output was displayed on a Tektronix, Model 564B, storage oscilloscope equipped with a Tektronic still camera, Model C-12.

A L.A.B. Corporation vibration machine, Serial No. 56801, Type 5000-96B which has a frequency servoloop constant displacement cam linked motor drive was used for the vibration test.

A pendulum-impact tester fabricated in accordance with Figure 1 of FTMS 101B, Method 5012, was used for the impact test.

TEST PROCEDURES AND RESULTS

AIM 9L/MARK 17 CONTAINERS: The following tests were conducted:

1. LEAK TEST: Immediately upon receipt of the container at the AFPEA, a leak test was conducted on the container in accordance with the procedure in FTMS 101B, Method 5009, paragraph 1.2(c) (see Figure 4).

RESULTS: The results of this test are shown in tabulated form below:

TABLE I

<u>TIME (SECONDS)</u>	<u>INCHES H₂O DISPLACED</u>	<u>PSIG</u>
00	41.60	1.50
30	41.60	1.50
60	41.60	1.50
90	41.60	1.50
120	41.60	1.50
150	41.60	1.50
180	41.60	1.50
210	41.60	1.50
240	41.60	1.50
270	41.60	1.50
300	41.60	1.50

2. VIBRATION TEST: A vibration test was conducted in accordance with the procedure in FTMS 101B, Method 5019. A one inch double amplitude and 4.5 Hz frequency was maintained for two hours (see Figure 5).

RESULTS: Visual inspection revealed no damage to the container. A maximum of 28 G's was recorded on the inert rocket motors during the test (see Figure 6).

3. CORNERWISE DROP (ROTATIONAL) TEST: The cornerwise drop (rotational) test was conducted in accordance with FTMS 101B, Method 5005. A 24 inch drop height was used during the tests. Drops were made once to each of two diagonally opposite corners of the base.

RESULTS: Visual inspection revealed that the first latch on the aft end and the first latch on the opposite end unbuckled during the first drop. A maximum of 100 G's was recorded on the inert rocket motors during the test. No damage was noted to the container.

4. EDGEWISE DROP (ROTATIONAL) TEST: The edgewise drop test was conducted in accordance with FTMS 101B, Method 5008. A 24 inch drop height was used during the tests. Drops were made once to each end of the container.

RESULTS: No damage was noted to the container. A maximum of 150 G's was recorded on the inert rocket motors during the test.

5. PENDULUM-IMPACT TEST: The pendulum-impact test was conducted in accordance with FTMS 101B, Method 5012. Impact was at seven feet per second. Both ends and both sides were impacted.

RESULTS: Visual inspection revealed that a pop rivet on the gasket retaining aluminum strip on the aft end sheared during the impact tests. A maximum of 12 G's was recorded on the inert rocket motors during the tests. No other damage was noted to the container.

6. LEAK TEST: At the end of the rough handling tests the container was leak tested in accordance with the procedure in FTMS 101B, Method 5009, paragraph 1.2(c).

RESULTS: Air pressure could not be maintained. Leaks were noted on the front end, at the spot welds (see Figure 7), and at the joint of the gasket.

AIM 9L/MARK 36 CONTAINER: The following tests were conducted:

1. LEAK TEST: Immediately upon receipt of the container at the AFPEA, a leak test was conducted on the container in accordance with the procedure in FTMS 101B, Method 5009, paragraph 1.2(c).

RESULTS: The results of this test are shown in tabulated form below:

TABLE II

<u>TIME (SECONDS)</u>	<u>INCHES H₂O DISPLACED</u>	<u>PSIG</u>
00	41.45	1.498
30	41.45	1.498
60	41.45	1.498
90	41.45	1.498

TABLE II (Continued)

<u>TIME (SECONDS)</u>	<u>INCHES H₂O DISPLACED</u>	<u>PSIG</u>
120	41.43	1.497
150	41.42	1.496
180	41.42	1.496
210	41.42	1.496
240	41.41	1.496
270	41.40	1.495
300	41.40	1.495

2. VIBRATION TEST: A vibration test was conducted in accordance with the procedure in FTMS 101B, Method 5019. A one inch double amplitude and 4.5 Hz frequency was maintained for two hours.

RESULTS: Visual inspection revealed that the pin which holds the latch bolt to the handle dropped out during the test and the cushioning in the top of the container slipped from center to the aft end (from 34 to 18 1/4 inches). A maximum of 5 G's was recorded on the inert rocket motors during the test.

3. CORNERWISE DROP (ROTATIONAL) TEST: The cornerwise drop test was conducted in accordance with FTMS 101B, Method 5005. A 24 inch drop height was used during the tests. Drops were made once to each of two diagonally opposite corners of the base.

RESULTS: Visual inspection revealed no damage to the containers. A maximum of 18 G's was recorded on the inert rocket motors during the test.

4. EDGEWISE DROP (ROTATIONAL) TEST: The edgewise drop test was conducted in accordance with FTMS 101B, Method 5008. A 24 inch drop height was used during the test. Drops were made once to each end of the container.

RESULTS: Visual inspection indicated no damage to the container. A maximum of 14 G's was recorded on the inert rocket motors during the tests.

5. PENDULUM-IMPACT TEST: The pendulum-impact test was conducted in accordance with FTMS 101B, Method 5012. Impact was at seven feet per second. Both ends and both sides were impacted.

RESULTS: Visual inspection revealed that the fin mounts of one motor made contact with another motor during the side impact. No readings were recorded. A maximum of 26 G's was recorded from end impact, on the inert rocket motors during the tests.

6. LEAK TEST: At the end of the rough handling tests the container was leak tested in accordance with FTMS 101B, Method 5009, paragraph 1.2(c).

RESULTS: Air pressure could not be maintained. Leaks were noted on front end, at spot welds, and at the joint of the gasket.

Test plan, Figure 3, was conducted on the AIM 9L/MARK 36 container when the redesigned cushioning was received from Eglin AFB FL. Tests were again conducted in accordance with FTMS 101B.

RESULTS: Visual inspection indicated no damage to the container. Maximum G readings recorded on the inert rocket motors during the tests were as follows:

- a. Vibration Test - 5 G's
- b. Cornerwise Drop (Rotational) Test - 20 G's
- c. Edgewise Drop (Rotational) Test - 20 G's
- d. Pendulum-Impact Test - 15 G's

DISCUSSION

Visual inspection of the containers at the end of the rough handling tests indicated no physical damage to the containers.

Instrumentation indicates the AIM 9L/MARK 36 has better designed cushioning than the AIM-9L/MARK 17 container.

AIR FORCE PACKAGING EVALUATION AGENCY (Container Test Plan)					AFPEA PROJECT NUMBER 77-P7-31	
CONTAINER SIZE	(GROSS)	W.T	(ITEM)	CUBE	QUANTITY	DATE
85-1/2x18-1/2x23	553		345	21.09	1	2 Aug 77
ITEM NAME				MANUFACTURER		
AIM-9L/MK 17/INERT ROCKET MOTOR				Metric Systems, Fort Walton Beach, FL		
CONTAINER NAME				CONTAINER COST		
C/L (AFPEA Designation)				\$150 (Approx)		
PACK DESCRIPTION						
Metal top and bottom with seal gasket						
CONDITIONING						
Ambient or as prescribed by test						
TEST NO.	IAW	PARAMETERS		ORIENTATION		INSTRUMENTED
<u>LEAK TEST</u>						
1	FTMS 101 Method 5009 Para 1.2 (C)	2.0 P. S. I.		Normal Position		Manometer
<u>VIBRATION TEST</u>						
2	FTMS 101 Method 5019	1" Double AMP. 4.5 HZ, 2 Hours		As required by test		Inst.
<u>ROUGH HANDLING TESTS</u>						
3	FTMS 101 Method 5005	24 inch Drop Height		Once to each of two Diagonally opposite corners of base		Inst.
4	FTMS 101 Method 5008	24 inch Drop Height		Once to each end of container		Inst.
5	FTMS 101 Method 5012	7 FPS Impact		Both ends - Both sides		Inst.
<u>LEAK TEST</u>						
6	FTMS 101 Method 5009 Para 1.2 (C)	2.0 P. S. I.		Normal Position		Manometer
COORDINATION						
COMMENTS	SYMBOL	NAME	DATE			
	PTPD	Barringer	3 Aug 77			
	30NT	Clay	5 Aug 77			
PREPARED BY				APPROVED BY		
<i>Edy Haulaki</i>				<i>Ralph Zynda</i>		

FIGURE 1

AIR FORCE PACKAGING EVALUATION AGENCY (Container Test Plan)					AFPEA PROJECT NUMBER 77-P7-31																						
CONTAINER SIZE	(GROSS) WT	(ITEM)	CUBE	QUANTITY	DATE																						
77-3/4"x18-1/2"x23	572	384 1/2	19.20	1	2 Aug 77																						
ITEM NAME				MANUFACTURER																							
AIM-9L/MK-36 Inert Rocket Motors				Metric Systems, Fort Walton Beach, FL																							
CONTAINER NAME				CONTAINER COST																							
C/S (AFPEA Designation)				\$150 (Approx)																							
PACK DESCRIPTION																											
Metal, top and bottom with seal gasket																											
CONDITIONING																											
Ambient or as prescribed by test																											
TEST NO.	IAW	PARAMETERS		ORIENTATION	INSTRUMENTED																						
LEAK TEST	FTMS 101 Method 5009 Para 1.2 (C)	2.0 P.S.I.		Normal Position	Manometer																						
VIBRATION TEST																											
2	FTMS 101 Method 5019	1" Double AMP. 4.5 HZ., 2 Hours		As required by test	Inst																						
ROUGH HANDLING TESTS																											
3	FTMS 101 Method 5005	24 inch drop height		Once to each of two diagonally opposite corners of base	Inst																						
4	FTMS 101 Method 5008	24 inch drop height		Once to each end of container	Inst																						
5	FTMS 101 Method 5012	7 FPS Impact		Both ends-both sides	Inst																						
LEAK TEST																											
6	FTMS 101 Method 5009 Para 1.2 (C)	2.0 P.S.I.			Manometer																						
COORDINATION																											
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">SYMBOL</th> <th style="width: 40%;">NAME</th> <th style="width: 35%;">DATE</th> </tr> </thead> <tbody> <tr> <td>PTPD</td> <td>Barringer</td> <td>3 Aug 77</td> </tr> <tr> <td>SPMT</td> <td>Clay</td> <td>3 Aug 77</td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>							SYMBOL	NAME	DATE	PTPD	Barringer	3 Aug 77	SPMT	Clay	3 Aug 77												
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PTPD	Barringer	3 Aug 77																									
SPMT	Clay	3 Aug 77																									
PREPARED BY <i>Edw. Kwaboki</i>				APPROVED BY <i>Ralph Jynka</i>																							

AIR FORCE PACKAGING EVALUATION AGENCY (Container Test Plan)					AFPEA PROJECT NUMBER 77-P7-37	
CONTAINER SIZE 77-3/4"X18-1/2X23	(GROSS) WT 572	(ITEM) CUBE 384 1/2	19.20	QUANTITY 1	DATE 15 Aug 77	
ITEM NAME AIM-9L/MK-36 Inert Rocket Motors				MANUFACTURER Metric Systems, Fort Walton Beach, FL		
CONTAINER NAME C/S (AFPEA Designation)				CONTAINER COST \$150 (Approx)		
PACK DESCRIPTION Metal top and bottom with seal gasket						
CONDITIONING						
TEST NO.	IAW	PARAMETERS	ORIENTATION	INSTRUMENTED		
VIBRATION TEST 2	FTMS 101 Method 5019	1" Double AMP. 4.5 HZ., 2 Hours	As required by test	Inst		
ROUGH HANDLING TEST 3	FTMS 101 Method 5005	24 inch drop height	Once to each of two diagonally opposite corners of base	Inst		
4	FTMS 101 Method 5008	24 inch drop height	Once to each end of container	Inst		
5	FTMS 101 Method 5012	7 FPS Impact	Both ends-both sides	Inst		
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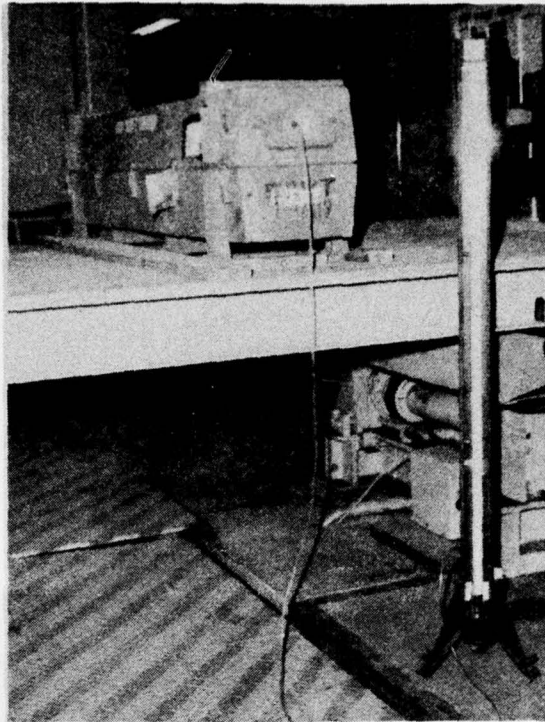


FIGURE 4. LEAK TEST USING WATER MANOMETER

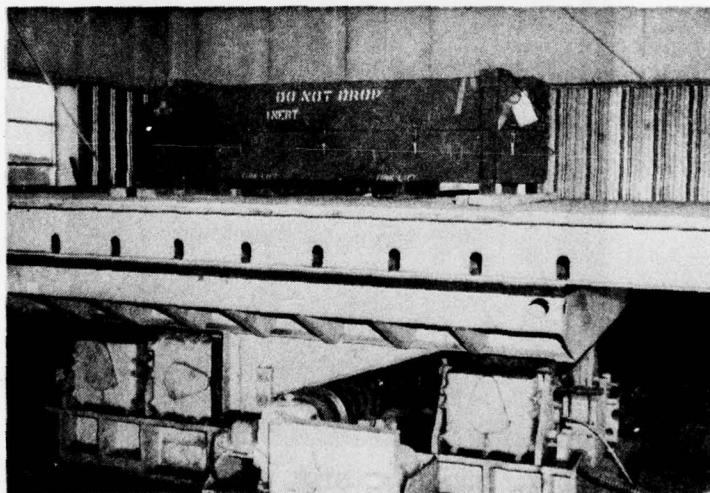


FIGURE 5. VIBRATION TEST



FIGURE 6. ACCELEROMETER MOUNTED ON ROCKET MOTOR

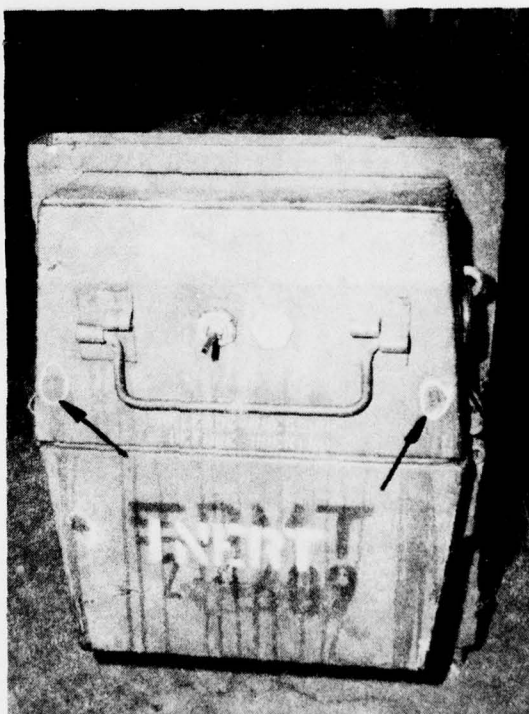


FIGURE 7. LEAKS AT SPOT WELDS, FRONT END

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